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METHODS OF ANALYSIS FOR FOODGRAINS

PART V DETERMINATION OF URIC ACID

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Indian Standard

METHODS OF ANALYSIS FOR FOODGRAINS

PART V DETERMINATION OF URIC ACID

0. FOREWORD

0.1 This Indian Standard (Part V) was adopted by the Indian Standards Institution on 27 April 1970, after the draft finalized by the Cereals and Pulses Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 With the increasing inter-state transactions and centralization of corporation and co-operative societies for handling foodgrains the assessment of their quality has assumed a greater significance recently. For proper assessment, it is necessary that only uniform methods of test are adopted and only such terms are used in test reports which have been defined properly. This standard, based on national and international practices is, therefore, being issued to ensure the adoption of uniform terminology and methods of test for foodgrains throughout the country.

0.3 Depending upon the situation, foodgrains are either analyzed for all or only some of the characteristics. This standard is, therefore, being issued in several parts. The first four parts cover the determination of refractions, moisture, hectolitre weight and weight of 1 000 grains respectively. This part covers the determination of uric acid content.

0.4 Various methods are employed for assessing insect damage in foodgrains. The methods consist of utilizing a number of physical or chemical indices for estimating the degree of insect infestation. Since uric acid is the main constituent of the insect excreta, estimation of this characteristic is most often taken as an index of the degree of insect infestation. This standard only covers determination of uric acid; a standard covering other methods of determining insect infestation is under preparation.

0.4.1 Experience within the country has shown that uric acid estimations according to the method outlined in this standard does not always give consistent results in certain foodgrains particularly those containing inherent uric acid. However, in the case of cereals and cereal products results obtained were found to be more consistent and reproducible. Hence the Committee responsible for the formulation of this standard decided to restrict the applicability of this method to only cereal products.

0.5 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes the method for the determination of uric acid in cereals and cereal products (*see* **0.4**).

2. PRINCIPLE OF METHOD

2.1 Proteins of a known weight of the sample are precipitated by sodium tungstate and sulphuric acid. An aliquot part of the protein-free filtrate is treated with uric acid reagent and sodium cyanide under standard conditions and the blue colour contained is compared colorimetrically against a similarly treated standard.

3. APPARATUS

3.1 Photo-Electric Colorimeter

3.2 Volumetric Flask — 50 ml capacity.

3.3 Burette

3.4 Nessler's Tubes

4. REAGENTS

4.1 Sodium Tungstate Solution — 10 percent (*w/v*).

4.2 Standard Sulphuric Acid Solution — 0·667 N.

4.3 Benedict's Uric Acid Reagent — prepared by first dissolving 100 g of pure sodium tungstate in 600 ml of water. Then add 5 g of arsenic acid (As_2O_5) followed by 25 ml of 85 percent phosphoric acid and 20 ml of concentrated hydrochloric acid. Boil the mixture for 20 minutes, cool and make volume up to 1 litre.

4.4 Sodium Cyanide Solution — 5 percent (*w/v*) solution containing 2 ml of ammonia per litre. This solution requires to be prepared anew after about 6 weeks.

4.5 Standard Uric Acid Solution (Benedict's)

4.5.1 *Stock Solution* — prepared by dissolving 9 g of disodium hydrogen phosphate and 1 g of sodium di-hydrogen phosphate in about 200 to 300 ml of hot water. If the solution is not clear, filter and make up the

*Rules for rounding off numerical values (*revised*).

volume to 500 ml with hot water. Weigh 200 mg of pure uric acid in one-litre volumetric flask and add a few millilitres of water to suspend the uric acid. Now add the solution made earlier and shake till the uric acid dissolves completely. Cool and add 1·4 ml of glacial acetic acid, dilute to mark and mix. To prevent bacterial or mould growth add 5 ml of chloroform. Five millilitres of this stock solution contains 1 mg of uric acid.

4.5.2 *Working Standard Solution* — prepared by diluting 50 ml of stock solution (**4.5.1**) containing 10 mg of uric acid with 400 ml of distilled water in a 500-ml volumetric flask. Add 25 ml of dilute hydrochloric acid (1 volume of concentrated hydrochloric acid and 9 volumes of water). Make the solution up to the mark and mix. This working standard solution should be prepared from stock solution (**4.5.1**) which is more than 10 days old.

5. PROCEDURE

5.1 Weigh 50 g of the sample (*see* **3.2** of IS : 2814-1964*) and pulverize it finely. Take from 4 to 20 g of the powder, expected to contain about 1 to 5 mg of uric acid and suspend in 200 ml of water. Allow the mixture to stand for two hours and then mix in Waring Blender for 10 minutes and centrifuge at about 2 000 rev/min for 10 minutes. To 100 ml of the clear centrifugate add 10 ml of sodium tungstate solution and mix. Then add 10 ml of standard sulphuric acid solution to precipitate the proteins present in the extract. Mix and allow it to stand for five minutes and filter. Take an aliquot of the filtrate (containing between 0·15 and 0·3 mg of uric acid for every 10 ml of the filtrate) in the 50-ml volumetric flask and add 5 ml of sodium cyanide solution followed by 1 ml of Benedict's uric acid reagent. Mix by gentle shaking and make up to the mark with distilled water.

5.2 Take 10 ml of standard uric acid solution (**4.5.2**) containing 0·2 mg of uric acid in a 50-ml flask and add 5 ml of sodium cyanide solution and 1 ml of Benedict's uric acid reagent. Dilute to the mark after 5 minutes and determine the intensity of colour either in a photoelectric colorimeter using a 520 nm (mμm) filter or by visual comparison in Nessler's tubes.

5.2.1 In case the determination is carried out by visual comparison, it may be necessary to have a number of standards containing varying proportions of uric acid for matching with the colour developed in the sample under test.

5.3 A parallel test using the same quantity of uninfested grains, as the sample under test should be run as the 'control'.

*Method for sampling of cereals and pulses.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 $kg.m/s^2$
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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